SFA Information Technology Architecture Framework — Phase I

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1. INTRODUCTION

The Office of Student Financial Assistance recognizes that its Information Technology (IT) Infrastructure must be more responsive to the needs of its various business organizations. An Information Technology Architecture (ITA) is intended as a tool to bridge the gap between business needs and IT capabilities, the ITA provides a broader context for the intersection of business requirements, technology and market trends and IT solutions.

Phase I of the Information Technology Architecture is the first iteration, it is intended to introduce a framework for subsequent detailing of the business architecture and all supporting technology.

This section of the SFA Information Technology Architecture Framework provides a definition and description of the target ITA, its value to SFA and its structural components. It also provides an outline of the remaining seven sections, which will describe the ITA components in detail and explain the ITA Enterprise Architecture Management (EAM) process.

1.1 About an Information Technology Architecture

1.1.1 Definition

An ITA is a logically consistent set of principles, policies and standards that guides the engineering of the organization's IT systems and infrastructure in a way that ensures alignment with business needs.

An ITA is not an Information Resources Management (IRM) plan or strategy. It is one manifestation of the organization's IT strategy, but the strategy also includes the organizational and resource planning needed to achieve its objectives. The term ITA should also not be confused with "infrastructure." Infrastructure refers to the technical architecture (hardware, software, networks) of an organization at a given point in time.

At a very high level, an ITA describes how an enterprise's IT resources are allocated, the types of activities that may be conducted and the functional physical location of those activities. It describes how the infrastructure will be laid out so that everyone can plan the most effective use of resources for the most optimal functioning of those resources in support of documented business objectives.

An enterprise's business strategy represents the business at a high level and establishes the principles and primary organization that guide the many detailed planning and implementation efforts that combine to realize the business strategy. Likewise, an enterprise IT planning effort must also establish the principles and primary structures that will guide and support the individual projects and programs that actually address the details of deploying IT. The architecture, therefore, is defined at a fairly high level of abstraction, making it more adaptable to frequent changes in business processes and supporting technologies.

ITA is a relatively new discipline and practitioners have assigned various definitions to it. Sometimes described as a "framework" or "blueprint," sometimes as a set of principles, the ITA is always presented as that document that links business requirements with IT development and investment. Indeed, this concept is at the core of the legislation that directs Federal agencies to develop and implement ITAs.

1.1.2 Clinger-Cohen Act

On July 16, 1996, President Clinton issued Executive Order 13011 entitled "Federal Information Technology" to implement the Information Technology Reform Act (ITMRA) of 1996 (also known as the Clinger-Cohen Act).[1] The Clinger-Cohen Act assigns Chief Information Officers (CIOs) the responsibility of "developing, maintaining and facilitating the implementation of a sound and integrated information technology architecture [ITA]" for their agencies. The Act defines an ITA as "an integrated framework for evolving and acquiring new information technology to achieve the Agency's strategic goals and information resource management goals" and states that the ITA must specify the "standards that enable information exchange and resource sharing."

Pursuant to the Clinger-Cohen Act, on October 25, 1996,[2] the Office of Management and Budget (OMB) issued a memorandum to the Executive Departments and Agencies providing direction regarding investments in major information systems. Included in that guidance were two key concepts applicable to this ITA. OMB directed that IT investments should (1) support core/priority mission functions that need to be performed by the Federal Government; and (2) be consistent with Federal, agency and bureau information architectures that integrate agency work processes and information flows with technology to achieve the agency's strategic goals; reflect the agency's technology vision and Year 2000 compliance plan; and specify standards that enable information exchange and resource sharing while retaining flexibility in the choice of suppliers and in the design of local work processes.

In order to ensure that SFA's IT investments support our key mission functions, SFA's ITA begins with the Business Architecture, which includes the SFA Strategic Plan and a Business Function Model. The Business Architecture forms the basis for the remaining components of the architecture. The SFA ITA is grounded in SFA's Strategic IT Vision and Plan (Draft; March 2000) and is consistent with the Federal framework for IT architectures. One of our objectives in developing the technology standards contained in this ITA was to promote interoperability across the enterprise while retaining flexibility for systems developers in developing systems and choosing technology suppliers.

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[1] One Hundred Fourth Congress of the United States of America, National Defense Authorization Act for Fiscal Year 1996, Division E - Information Technology Management Reform, Section 5125. Agency Chief Information Officer, Subsection (a)(1)(b) General Responsibilities, (Washington, D.C., 1996)

[2] OMB, Franklin D. Raines Memorandum, 25 October 1996 (OMB 97-02)

On June 18, 1997,[3] OMB defined the three major components of an ITA: (1) the enterprise architecture consisting of business processes, information flows and relationships, applications, data descriptions and technology infrastructure; (2) the Technical Reference Model (TRM); and (3) the Standards Profile.

The TRM and Standards Profile apply to systems applications and the technology infrastructure. The TRM provides a mechanism for understanding how disparate technologies relate to each other. The TRM is not a specific system design, but rather the definition of a set of services and interfaces common to an enterprise's information systems. The SFA TRM is defined and presented in Section 6.5 of this document. The standards profiles define the technology standards to be applied in developing/acquiring systems components.

In recent years, Congress has enacted several statutes to instill a more performance-based approach to the management and accountability of the Federal Government. This statutory framework includes the Government Performance and Results Act; financial management statutes, such as the Chief Financial Officers Act; and information resources management statutes, such as the aforementioned Clinger-Cohen Act. Implemented together, these laws provide a powerful framework for developing and fully integrating information about agencies' missions and strategic priorities, the results-oriented performance goals that flow from those priorities, performance data to show the level of achievement of those goals and the relationship of IT investments to the achievement of performance goals.

Over the past several years SFA has recognized the value of developing an enterprise ITA and has set its sights on accomplishing this effort with a sense of urgency. Added to this urgency are the lessons learned from industry best practices as well as the need to comply with the requirements set forth in Federal mandates. These drivers, as well as the importance of meeting its IT goals and objectives, have led SFA to focus on the development of this enterprise ITA. In addition to helping SFA comply with Federal mandates, a well-planned ITA will facilitate SFA's achievement of its business goals and adherence to its IT direction.

1.1.3 Value of an ITA

The nature of data processing has changed greatly in recent years. Today's users have more computing power at their desktops than mainframes had just a decade ago. Each year, new and better applications, software, hardware and peripherals are being developed. Each advance offers new opportunities to increase processing capability and improve service to our customers. But every change we make to part of a system, whether to take advantage of new technologies or to respond to business changes, potentially affects many other parts of that and potentially other partner system. Furthermore, the systems that we build today must be capable of integrating with those that we build tomorrow. Creating an IT environment that is adaptable to such change requires a detailed plan. Such a plan must identify the individual components of the architecture to be used in the development of systems and must also ensure

[3] OMB, Franklin D. Raines Memorandum, 18 June 1997 (OMB 97-16)

that those components work together for the benefit of the whole, and in support of stated business objectives and goals.

SFA's ITA contains a set of standards and guidelines to be used in the technical design of SFA's information systems. It provides guidance for the selection and implementation of computing platforms, software, networks and related products that interconnect the systems and ensure their interoperability. The standards guidelines in the ITA serve to support those who are making technology-based decisions for SFA. Rather than resorting to out-of-context, ad-hoc studies to facilitate strategic IT decision making, IT managers can look to the ITA for guidance and direction to capitalize on the technologies of the future while preserving today's investments. The goal is to enable SFA to optimize its systems and make the whole greater than the sum of its parts. By encouraging standardization of products and processes that are compatible with the architecture and by providing guidance to planners, designers and implementers, the ITA represents a major step toward optimal, cost-effective resource utilization.

The ITA is a tool that can be employed when planning for anticipated changes in hardware and software. When new IT requirements present themselves, users can look to the ITA for guidance in the selection of appropriate tools to satisfy those requirements. They can do so with confidence that their selections are compatible with SFA standards and direction and that assistance in the acquisition, implementation and support of those tools will continue to be available.

In addition, the ITA document, when complete, provides several intrinsic benefits for SFA, including the following:

- A standard vocabulary about IT to facilitate communication;
- Documentation of business functions and processes to increase understanding of how SFA carries out its mission;
- Business and information models that can be used to assess the impacts of change and to measure work; and
- A single source of information (the "Information Resources Catalogue") about the IT resources (data, applications, platforms) available to users.

The key users of the SFA ITA will include SFA Channels, IT staff, application system managers and contractors. For management information purposes, this document is also used by SFA's CIO, senior IT managers and Department of Education CIO.

To oversee the implementation of the ITA, SFA will adopt a governance approach to integrate the architectural concepts, policies and standards guidance into SFA's everyday IT decision-making. Governance formalizes who within SFA has responsibility for making technology decisions and how those decisions are made. SFA's governance approach consists of two (2) key processes:

1. *IT Investment Review Process*

   - Supports SFA's leadership in their consideration of IT investments by ensuring that required technology analyses are conducted and full resource costing is identified.
   - Promotes effective management of IT resources and projects by validating costs, workload, schedule and technology assumptions.
   - Ensures compliance with the Clinger-Cohen Act.

2. *Enterprise Architecture Management (EAM)*

   - Formalizes enterprise-wide acceptance and approval of proposed policies and standards for the acquisition and deployment of IT resources. Ensures that business and technology decisions are made at the appropriate levels of management within SFA and promotes consistency in IT decision making throughout the enterprise.
   - Provides an enforcement mechanism for ensuring that projects requiring the acquisition and deployment of IT resources do so in a manner consistent with the architecture policies and standards guidance. Provides for the identification and periodic assessment of major IT projects that may impact the progress or direction of the target architecture.
   - Provides for the periodic review and reassessment ("evergreening") of enterprise-wide architecture policies and standards to ensure that the ITA takes into account changes in today's dynamic technology marketplace and stays in continual alignment with SFA's strategic goals and evolving information systems needs.

Through the governance processes (EAM), SFA will be able to determine whether technology decisions are of enterprise importance or local concern. SFA's governance structure for implementing these processes will include existing as well as newly defined organizational bodies and will comprise business and IT decision makers. The SFA EAM process is further described in Section 8.

The full value of the ITA will be realized once its usage has been institutionalized throughout SFA. SFA can position itself for success through continuous communication among all stakeholders, clear architectural strategies and architectural planning. A firm commitment from IT management and from user organizations to adopt and support the ITA is key to its effective implementation and usefulness.

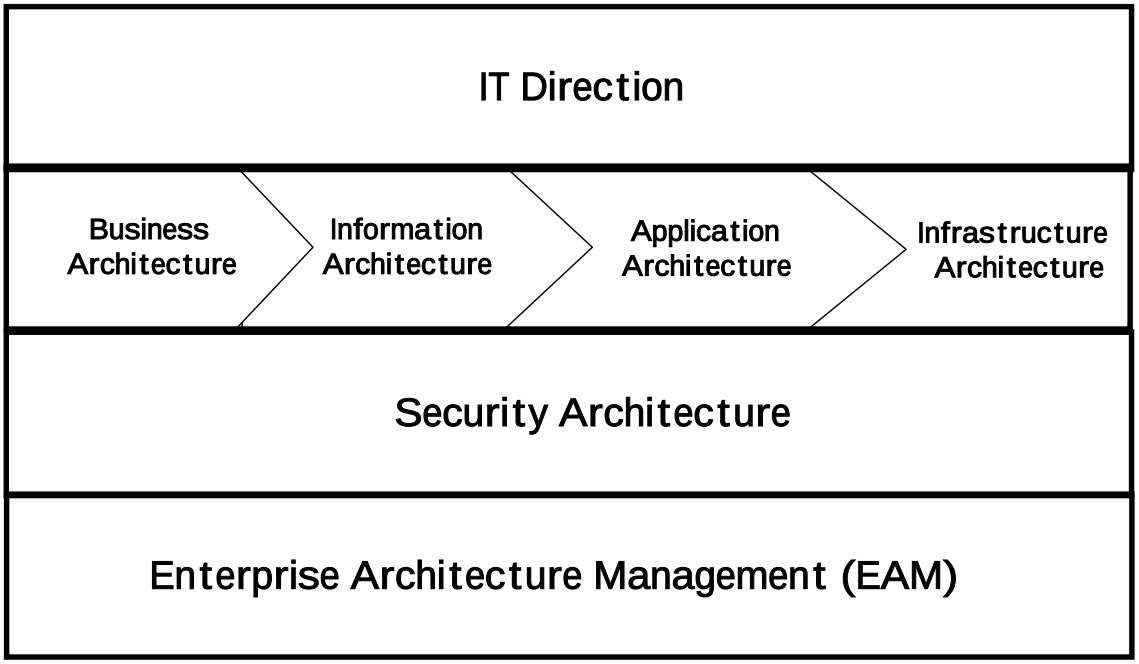
1.2 About the SFA Target ITA

1.2.1 Components of the ITA

The target ITA is composed of seven (7) distinct, but interrelated, structural components – these are: IT Direction, Business Architecture, Information Architecture, Application Architecture, Infrastructure Architecture, Security Architecture and Enterprise Architecture Management

(EAM). As a whole, these components form an integrated enterprise architecture designed to align IT with SFA's current and strategic business goals. To oversee the implementation of these components, SFA will adopt a management and governance approach, which will integrate the architectural concepts, policies and standards guidance into SFA's everyday IT decision making. Exhibit 1-1 depicts these components.

Exhibit 1-1: SFA's ITA Components



1.2.2 IT Direction

Description: IT Direction is composed of the IT Vision, IT Objectives and Guiding Principles, which collectively provide direction to the IT organization in fulfilling the technology mission that supports the business goals.

Business Value: The business value of the IT Direction is primarily the articulation of how technology will be used to support the business. This articulation is information/ communication/education to the business, which the business can accept or modify. It opens dialogue with the business and should be used to facilitate the partnership relationship that is critical between the business and IT organizations.

1.2.3 Business Architecture

Description: The Business Architecture describes the state of SFA's business from an enterprise-wide perspective. It represents the functions and processes that support the business, from the enterprise's and organization's physical locations and forces that lead to

business change. For any enterprise architecture effort to be successful it must be linked to the business direction of the organization. The Business Architecture shows this linkage.

Business Value: The Business Architecture serves as the knowledge base for the ITA, helping tie the business of the organization to its IT by defining what, where, by whom and why SFA's business is performed. In addition to serving as the foundation for the ITA, the Business Architecture can serve as a stimulus for developing detailed business plans and business contingency plans for SFA; can be used in performing impact analyses when adapting to changing business needs; and can be used when conducting broad-based reorganizations.

1.2.4 Information Architecture

Description: The Information Architecture links information behavior, information management processes and information support staff to other aspects of the organization such as business processes, organizational structure and physical location. It will ultimately include engineered models, maps, directories, policies and standards to aid in matching information requirements with information resources. It identifies the major types of information that are needed to support the business functions defined in the future Business Architecture.

Business Value: The Information Architecture is an essential component of the ITA that provides a framework for identifying, developing and evaluating policy needed to effectively manage and protect SFA's information and data resources; promotes a common vocabulary for discussing and understanding SFA's information usage and future needs; identifies SFA's data and information assets and their means of access; and facilitates an environment where technology enables the transformation of data and information into business knowledge.

1.2.5 Application Architecture

Description: The Application Architecture defines how applications are to be designed, how they cooperate with each other and where they reside within the hardware, software and communications network infrastructure. It recommends the orderly grouping of applications around the business processes they support and the data and information they maintain. The Application Architecture provides a conceptual view of the preferred logical components of an application and specific design guidance in the development of these components in order to create adaptable applications that are more modular and granular in scope. It describes how to develop applications that are "component-ized," service oriented and can easily be integrated to work in a cooperative fashion under a distributed processing, client/server design model. Applications that are modular and granular in scope enable SFA to quickly adapt its information systems in response to changes in business requirements, operational needs, or technology.

Business Value: The Application Architecture guides SFA toward an IT environment whereby applications are more adaptable to change, the maintenance of applications is less burdensome. The application architecture and all its' components are geared towards supporting business requirements while utilizing standards and guidelines documented in the overall ITA.

1.2.6 Infrastructure Architecture

Description: The Infrastructure Architecture identifies and describes the hardware, software and communications network technologies required to manage (Systems Management) business applications throughout SFA's enterprise. It is the lowest layer in the information technology architecture hierarchy and is driven by the business requirements and the design of the three higher architectural layers (business, information, application). The Infrastructure Architecture provides a Technical Reference Model (TRM)—a taxonomy for organizing and describing technologies to be used within SFA's enterprise for the design and development of information systems.

Business Value: The Infrastructure Architecture establishes enterprise standards for all technologies used for applications development and information access within SFA. Management and technology policies and standards allow SFA to manage the insertion of new technology and the exiting of obsolete technology within the infrastructure, leverage the use of technology to maximize its benefits, contain costs and better control its technology destiny.

1.2.7 Security Architecture

Description: The Security Architecture identifies and defines the major security services that are needed to protect the enterprise business functions and processes, information and application systems as defined in the SFA ITA. The security architecture provides a high-level framework within which to identify enterprise security policies and manage the distribution, utilization and administration of security services throughout the enterprise.

Business Value: The Security Architecture helps to ensure the implementation of an enterprise-wide approach to security within the design, development, deployment and use of information, applications and infrastructure throughout SFA in a manner consistent with Federal policies and guidelines.

1.2.8 Enterprise Architecture Management (EAM)

Description: Management and Governance provide a formal methodology for supporting the process by which decisions regarding technology are made within SFA. The EAM should be seen as a contributor to the existing IRB process.

Business Value: A governance structure determines the responsibilities of the various parties and includes a framework for resolving disputes. It balances the common good and individual liberty by defining what is of central importance and what is local. Adherence to this principle will enable SFA to share responsibility of the deployment, operations and management of technology with all components and stakeholders. It will also ensure business unit participation in evaluating and making IT investment decisions using consistent criteria and will maximize the use of IT resources across the enterprise.

1.2.9 Framework

The purpose of strategic IT planning is to provide a long-range view of how enterprise-wide use of IT will align with and enhance achievement of the enterprise's business strategy. One effective way to represent the enterprise is through a conceptual representation or framework, which allows people to agree on definitions, build common understanding and identify issues for resolution. The ITA begins with a conceptual framework that provides a simple and familiar structure that can be used to understand how the components of IT are related to and interact with each other in support of the Business Objectives. To assist in the development of the ITA, Student Financial Assistance has utilized an industry "best practice": a Strategic Enterprise IT Planning Framework that portrays the components and views of the ITA.

There are different levels at which an architecture can be examined from high level and abstract to concrete and tangible. The IT Planning Framework identifies the various aspects of technology that must be addressed by an ITA. The approach and concepts behind this planning framework were adapted from a framework for enterprise architecture defined by John A. Zachman. As seen in Exhibit 1-2, the framework lists the architecture components for each view (Planner, Owner, Architect, Builder, Assessor and Change Agent).

Exhibit 1-2: Strategic Enterprise IT Planning Framework

	Views	Drivers			IT Architecture				
	Abstraction Level	**Management and Governance**	**Business Architecture**	**IT Direction**	**Information Architecture**	**Application Architecture**	**Infrastructure Architecture**	**Systems Management**	**Security**
PHASE 1 DEVELOPMENT	**Strategic** *Ballpark View*	▶ Investment Review Board (IRB)	▶ Business Vision ▶ Business Objectives	▶ IT Objectives	▶ Information Component Overview	▶ Application Component Overview	▶ Infrastructure Component Overview	▶ Systems Management Component Overview	▶ Security Component Overview

	Views	Drivers			IT Architecture				
	Abstraction Level	**Management and Governance**	**Business Architecture**	**IT Direction**	**Information Architecture**	**Application Architecture**	**Infrastructure Architecture**	**Systems Management**	**Security**
	Owner's View	▸ Architecture Management Board	▸ Operating Principles ▸ Business Context and Direction ▸ Business Context Model ▸ Business Function-Process Model ▸ Logical Business Locations ▸ Organizational Structure ▸ Function-Process Responsibilities ▸ Process Location and Usage Map	▸ Guiding Principles	▸ Information Portfolio ▸ Information to Function Matrix ▸ Information to Organization Matrix ▸ Information to Application Matrix ▸ Information Location and Usage Map ▸ Conceptual Data Model	▸ Application Portfolio ▸ Application to Core Capability Matrix ▸ Application to Organization Matrix ▸ Application Location and Usage Map ▸ Core Application Flowchart ▸ Application Guiding Principles	▸ Infrastructure Portfolio ▸ Infrastructure to Organization Matrix ▸ Infrastructure to Information Matrix ▸ Infrastructure to Application Matrix ▸ Technology Drivers	▸ Systems Management Functions ▸ Systems Management to Organization Matrix ▸ Systems Management to Information Matrix ▸ Systems Management to Application Matrix ▸ Systems Management to Infrastructure Matrix	▸ Security Functions ▸ Security to Organization Matrix ▸ Security to Information Matrix ▸ Security to Application Matrix ▸ Security to Infrastructure Matrix
	Logical *Architect's View*	▸ Architecture Working Group(s)	▸ Business Policies ▸ Detailed Process/Value	▸ IT Policy ▸ IT Selections	▸ Information Blueprint	▸ Application Blueprint ▸ Application Component	▸ Infrastructure Blueprint	▸ Systems Management Blueprint	▸ Security Blueprint

	Views	Drivers			IT Architecture				
	Abstraction Level	**Management and Governance**	**Business Architecture**	**IT Direction**	**Information Architecture**	**Application Architecture**	**Infrastructure Architecture**	**Systems Management**	**Security**
			Flows			Structure			
SUBSEQUENT PHASES OF DEVELOPMENT	**Physical** *Builder's View*		▶ Business Standards and Procedures ▶ Business Agreements ▶ Work Flows ▶ Roles/Responsibilities	▶ IT Selections	▶ Information Allocations ▶ Information Implementation Designs	▶ Application Selections ▶ Application Allocations ▶ Application Implementation Designs	▶ Infrastructure Selections ▶ Infrastructure Allocations ▶ Infrastructure Implementation Designs	▶ Systems Management Selections ▶ Systems Management Allocations ▶ Systems Management Implementation Designs	
	Situational *Assessor's View*		▶ Current Performance Metrics ▶ Industry/Market Trends ▶ Performance Gaps ▶ Business Drivers for Change	▶ IT Direction Assessment ▶ Gap Analysis	▶ Information Assessment	▶ Application Assessment	▶ Infrastructure Assessment	▶ Systems Management Assessment	

	Views	Drivers			IT Architecture				
	Abstraction Level	**Management and Governance**	**Business Architecture**	**IT Direction**	**Information Architecture**	**Application Architecture**	**Infrastructure Architecture**	**Systems Management**	**Security**
	tional *Change Agent's View*		▸ Target Performance Metrics	▸ Transition Approach ▸ Transition Initiatives ▸ Business Value of Initiatives ▸ Initiative Schedule					

1.3 ITA Document Outline

Each of the components of the target ITA is described in detail in one of the upcoming sections. The sections describe the interrelationships of SFA's business functions and its use of IT to support those functions. Having provided an introduction to the subject matter, this first section will be followed by Sections 2 through 8, which address the remaining components of the ITA:

Section 2: IT Direction

Section 3: Business Architecture

Section 4: Information Architecture

Section 5: Application Architecture

Section 6: Infrastructure Architecture

Section 7: Security Architecture

Section 8: Enterprise Architecture Management (EAM)

1.4 Project Phases

SFA is currently in the "framework" phase of the target ITA development. In this phase of the project, the ITA Staff will develop a Conceptual Architecture that covers at a high level the following components of the architecture: IT Direction, Business Architecture, Information Architecture, Application Architecture, Infrastructure Architecture and Security Architecture and establish the EAM framework. Future phases of this effort will build out the SFA ITA.

1.5 Evergreening

Technological changes, as well as ongoing technology assessments, will drive architectural updates and adjustments. End-users of the technology may also influence the architecture as technology is applied to their business processes and new functional requirements are realized. All of these factors contribute to the need for continuing updates of the architecture. Such updates will be planned and conducted under the management and governance process. We call this "Evergreening."

2. INTRODUCTION

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ITA is a relatively new discipline and practitioners have assigned various definitions to it. Sometimes described as a "framework" or "blueprint," sometimes as a set of principles, the ITA is always presented as that document that links business requirements with IT development and investment. Indeed, this concept is at the core of the legislation that directs Federal agencies to develop and implement ITAs.

2.1.2 Clinger-Cohen Act

On July 16, 1996, President Clinton issued Executive Order 13011 entitled "Federal Information Technology" to implement the Information Technology Reform Act (ITMRA) of 1996 (also known as the Clinger-Cohen Act).[4] The Clinger-Cohen Act assigns Chief Information Officers (CIOs) the responsibility of "developing, maintaining and facilitating the implementation of a sound and integrated information technology architecture [ITA]" for their agencies. The Act defines an ITA as "an integrated framework for evolving and acquiring new information technology to achieve the Agency's strategic goals and information resource management goals" and states that the ITA must specify the "standards that enable information exchange and resource sharing."

Pursuant to the Clinger-Cohen Act, on October 25, 1996,[5] the Office of Management and Budget (OMB) issued a memorandum to the Executive Departments and Agencies providing direction regarding investments in major information systems. Included in that guidance were two key concepts applicable to this ITA. OMB directed that IT investments should (1) support core/priority mission functions that need to be performed by the Federal Government; and (2) be consistent with Federal, agency and bureau information architectures that integrate agency work processes and information flows with technology to achieve the agency's strategic goals; reflect the agency's technology vision and Year 2000 compliance plan; and specify standards that enable information exchange and resource sharing while retaining flexibility in the choice of suppliers and in the design of local work processes.

In order to ensure that SFA's IT investments support our key mission functions, SFA's ITA begins with the Business Architecture, which includes the SFA Strategic Plan and a Business Function Model. The Business Architecture forms the basis for the remaining components of the architecture. The SFA ITA is grounded in SFA's Strategic IT Vision and Plan (Draft; March 2000) and is consistent with the Federal framework for IT architectures. One of our objectives in developing the technology standards contained in this ITA was to promote interoperability across the enterprise while retaining flexibility for systems developers in developing systems and choosing technology suppliers.

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[1] One Hundred Fourth Congress of the United States of America, National Defense Authorization Act for Fiscal Year 1996, Division E - Information Technology Management Reform, Section 5125. Agency Chief Information Officer, Subsection (a)(1)(b) General Responsibilities, (Washington, D.C., 1996)

[2] OMB, Franklin D. Raines Memorandum, 25 October 1996 (OMB 97-02)

On June 18, 1997,[6] OMB defined the three major components of an ITA: (1) the enterprise architecture consisting of business processes, information flows and relationships, applications, data descriptions and technology infrastructure; (2) the Technical Reference Model (TRM); and (3) the Standards Profile.

The TRM and Standards Profile apply to systems applications and the technology infrastructure. The TRM provides a mechanism for understanding how disparate technologies relate to each other. The TRM is not a specific system design, but rather the definition of a set of services and interfaces common to an enterprise's information systems. The SFA TRM is defined and presented in Section 6.5 of this document. The standards profiles define the technology standards to be applied in developing/acquiring systems components.

In recent years, Congress has enacted several statutes to instill a more performance-based approach to the management and accountability of the Federal Government. This statutory framework includes the Government Performance and Results Act; financial management statutes, such as the Chief Financial Officers Act; and information resources management statutes, such as the aforementioned Clinger-Cohen Act. Implemented together, these laws provide a powerful framework for developing and fully integrating information about agencies' missions and strategic priorities, the results-oriented performance goals that flow from those priorities, performance data to show the level of achievement of those goals and the relationship of IT investments to the achievement of performance goals.

Over the past several years SFA has recognized the value of developing an enterprise ITA and has set its sights on accomplishing this effort with a sense of urgency. Added to this urgency are the lessons learned from industry best practices as well as the need to comply with the requirements set forth in Federal mandates. These drivers, as well as the importance of meeting its IT goals and objectives, have led SFA to focus on the development of this enterprise ITA. In addition to helping SFA comply with Federal mandates, a well-planned ITA will facilitate SFA's achievement of its business goals and adherence to its IT direction.

2.1.3 Value of an ITA

The nature of data processing has changed greatly in recent years. Today's users have more computing power at their desktops than mainframes had just a decade ago. Each year, new and better applications, software, hardware and peripherals are being developed. Each advance offers new opportunities to increase processing capability and improve service to our customers. But every change we make to part of a system, whether to take advantage of new technologies or to respond to business changes, potentially affects many other parts of that and potentially other partner system. Furthermore, the systems that we build today must be capable of integrating with those that we build tomorrow. Creating an IT environment that is adaptable to such change requires a detailed plan. Such a plan must identify the individual components of the architecture to be used in the development of systems and must also ensure

[3] OMB, Franklin D. Raines Memorandum, 18 June 1997 (OMB 97-16)

that those components work together for the benefit of the whole, and in support of stated business objectives and goals.

SFA's ITA contains a set of standards and guidelines to be used in the technical design of SFA's information systems. It provides guidance for the selection and implementation of computing platforms, software, networks and related products that interconnect the systems and ensure their interoperability. The standards guidelines in the ITA serve to support those who are making technology-based decisions for SFA. Rather than resorting to out-of-context, ad-hoc studies to facilitate strategic IT decision making, IT managers can look to the ITA for guidance and direction to capitalize on the technologies of the future while preserving today's investments. The goal is to enable SFA to optimize its systems and make the whole greater than the sum of its parts. By encouraging standardization of products and processes that are compatible with the architecture and by providing guidance to planners, designers and implementers, the ITA represents a major step toward optimal, cost-effective resource utilization.

The ITA is a tool that can be employed when planning for anticipated changes in hardware and software. When new IT requirements present themselves, users can look to the ITA for guidance in the selection of appropriate tools to satisfy those requirements. They can do so with confidence that their selections are compatible with SFA standards and direction and that assistance in the acquisition, implementation and support of those tools will continue to be available.

In addition, the ITA document, when complete, provides several intrinsic benefits for SFA, including the following:

- A standard vocabulary about IT to facilitate communication;
- Documentation of business functions and processes to increase understanding of how SFA carries out its mission;
- Business and information models that can be used to assess the impacts of change and to measure work; and
- A single source of information (the "Information Resources Catalogue") about the IT resources (data, applications, platforms) available to users.

The key users of the SFA ITA will include SFA Channels, IT staff, application system managers and contractors. For management information purposes, this document is also used by SFA's CIO, senior IT managers and Department of Education CIO.

To oversee the implementation of the ITA, SFA will adopt a governance approach to integrate the architectural concepts, policies and standards guidance into SFA's everyday IT decision-making. Governance formalizes who within SFA has responsibility for making technology decisions and how those decisions are made. SFA's governance approach consists of two (2) key processes:

3. *IT Investment Review Process*

   - Supports SFA's leadership in their consideration of IT investments by ensuring that required technology analyses are conducted and full resource costing is identified.
   - Promotes effective management of IT resources and projects by validating costs, workload, schedule and technology assumptions.
   - Ensures compliance with the Clinger-Cohen Act.

4. *Enterprise Architecture Management (EAM)*

   - Formalizes enterprise-wide acceptance and approval of proposed policies and standards for the acquisition and deployment of IT resources. Ensures that business and technology decisions are made at the appropriate levels of management within SFA and promotes consistency in IT decision making throughout the enterprise.
   - Provides an enforcement mechanism for ensuring that projects requiring the acquisition and deployment of IT resources do so in a manner consistent with the architecture policies and standards guidance. Provides for the identification and periodic assessment of major IT projects that may impact the progress or direction of the target architecture.
   - Provides for the periodic review and reassessment ("evergreening") of enterprise-wide architecture policies and standards to ensure that the ITA takes into account changes in today's dynamic technology marketplace and stays in continual alignment with SFA's strategic goals and evolving information systems needs.

Through the governance processes (EAM), SFA will be able to determine whether technology decisions are of enterprise importance or local concern. SFA's governance structure for implementing these processes will include existing as well as newly defined organizational bodies and will comprise business and IT decision makers. The SFA EAM process is further described in Section 8.

The full value of the ITA will be realized once its usage has been institutionalized throughout SFA. SFA can position itself for success through continuous communication among all stakeholders, clear architectural strategies and architectural planning. A firm commitment from IT management and from user organizations to adopt and support the ITA is key to its effective implementation and usefulness.

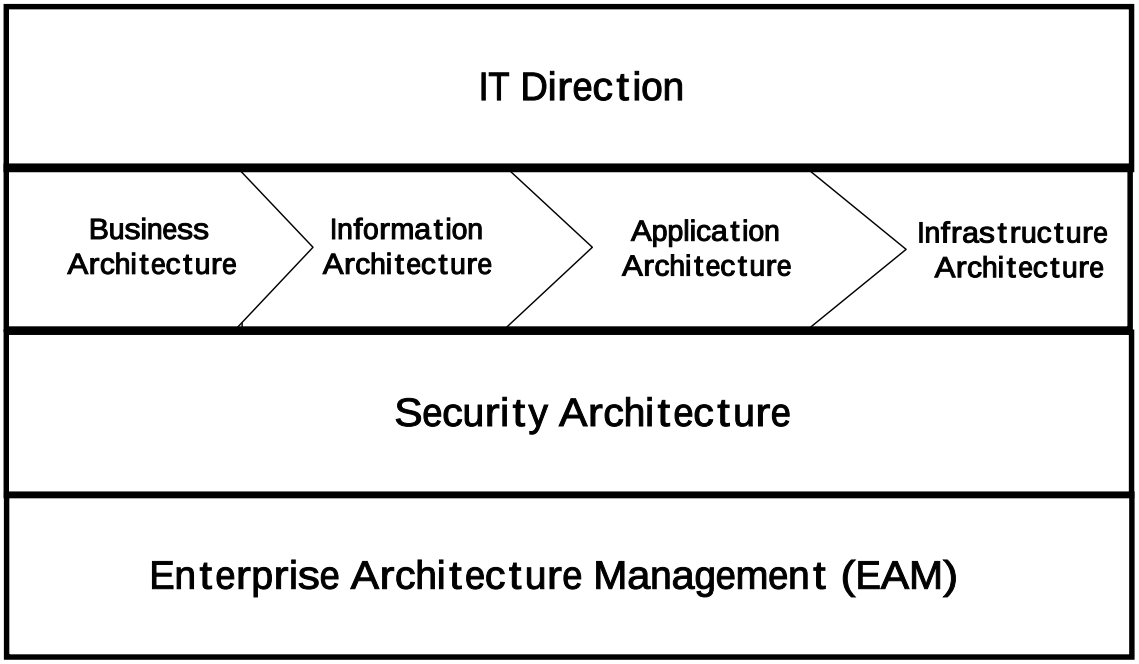
2.2 About the SFA Target ITA

2.2.1 Components of the ITA

The target ITA is composed of seven (7) distinct, but interrelated, structural components – these are: IT Direction, Business Architecture, Information Architecture, Application Architecture, Infrastructure Architecture, Security Architecture and Enterprise Architecture Management

(EAM). As a whole, these components form an integrated enterprise architecture designed to align IT with SFA's current and strategic business goals. To oversee the implementation of these components, SFA will adopt a management and governance approach, which will integrate the architectural concepts, policies and standards guidance into SFA's everyday IT decision making. Exhibit 1-1 depicts these components.

Exhibit 1-1: SFA's ITA Components



2.2.2 IT Direction

Description: IT Direction is composed of the IT Vision, IT Objectives and Guiding Principles, which collectively provide direction to the IT organization in fulfilling the technology mission that supports the business goals.

Business Value: The business value of the IT Direction is primarily the articulation of how technology will be used to support the business. This articulation is information/ communication/education to the business, which the business can accept or modify. It opens dialogue with the business and should be used to facilitate the partnership relationship that is critical between the business and IT organizations.

2.2.3 Business Architecture

Description: The Business Architecture describes the state of SFA's business from an enterprise-wide perspective. It represents the functions and processes that support the business, from the enterprise's and organization's physical locations and forces that lead to

business change. For any enterprise architecture effort to be successful it must be linked to the business direction of the organization. The Business Architecture shows this linkage.

Business Value: The Business Architecture serves as the knowledge base for the ITA, helping tie the business of the organization to its IT by defining what, where, by whom and why SFA's business is performed. In addition to serving as the foundation for the ITA, the Business Architecture can serve as a stimulus for developing detailed business plans and business contingency plans for SFA; can be used in performing impact analyses when adapting to changing business needs; and can be used when conducting broad-based reorganizations.

2.2.4 Information Architecture

Description: The Information Architecture links information behavior, information management processes and information support staff to other aspects of the organization such as business processes, organizational structure and physical location. It will ultimately include engineered models, maps, directories, policies and standards to aid in matching information requirements with information resources. It identifies the major types of information that are needed to support the business functions defined in the future Business Architecture.

Business Value: The Information Architecture is an essential component of the ITA that provides a framework for identifying, developing and evaluating policy needed to effectively manage and protect SFA's information and data resources; promotes a common vocabulary for discussing and understanding SFA's information usage and future needs; identifies SFA's data and information assets and their means of access; and facilitates an environment where technology enables the transformation of data and information into business knowledge.

2.2.5 Application Architecture

Description: The Application Architecture defines how applications are to be designed, how they cooperate with each other and where they reside within the hardware, software and communications network infrastructure. It recommends the orderly grouping of applications around the business processes they support and the data and information they maintain. The Application Architecture provides a conceptual view of the preferred logical components of an application and specific design guidance in the development of these components in order to create adaptable applications that are more modular and granular in scope. It describes how to develop applications that are "component-ized," service oriented and can easily be integrated to work in a cooperative fashion under a distributed processing, client/server design model. Applications that are modular and granular in scope enable SFA to quickly adapt its information systems in response to changes in business requirements, operational needs, or technology.

Business Value: The Application Architecture guides SFA toward an IT environment whereby applications are more adaptable to change, the maintenance of applications is less burdensome. The application architecture and all its' components are geared towards supporting business requirements while utilizing standards and guidelines documented in the overall ITA.

2.2.6 Infrastructure Architecture

Description: The Infrastructure Architecture identifies and describes the hardware, software and communications network technologies required to manage (Systems Management) business applications throughout SFA's enterprise. It is the lowest layer in the information technology architecture hierarchy and is driven by the business requirements and the design of the three higher architectural layers (business, information, application). The Infrastructure Architecture provides a Technical Reference Model (TRM)—a taxonomy for organizing and describing technologies to be used within SFA's enterprise for the design and development of information systems.

Business Value: The Infrastructure Architecture establishes enterprise standards for all technologies used for applications development and information access within SFA. Management and technology policies and standards allow SFA to manage the insertion of new technology and the exiting of obsolete technology within the infrastructure, leverage the use of technology to maximize its benefits, contain costs and better control its technology destiny.

2.2.7 Security Architecture

Description: The Security Architecture identifies and defines the major security services that are needed to protect the enterprise business functions and processes, information and application systems as defined in the SFA ITA. The security architecture provides a high-level framework within which to identify enterprise security policies and manage the distribution, utilization and administration of security services throughout the enterprise.

Business Value: The Security Architecture helps to ensure the implementation of an enterprise-wide approach to security within the design, development, deployment and use of information, applications and infrastructure throughout SFA in a manner consistent with Federal policies and guidelines.

2.2.8 Enterprise Architecture Management (EAM)

Description: Management and Governance provide a formal methodology for supporting the process by which decisions regarding technology are made within SFA. The EAM should be seen as a contributor to the existing IRB process.

Business Value: A governance structure determines the responsibilities of the various parties and includes a framework for resolving disputes. It balances the common good and individual liberty by defining what is of central importance and what is local. Adherence to this principle will enable SFA to share responsibility of the deployment, operations and management of technology with all components and stakeholders. It will also ensure business unit participation in evaluating and making IT investment decisions using consistent criteria and will maximize the use of IT resources across the enterprise.

2.2.9 Framework

The purpose of strategic IT planning is to provide a long-range view of how enterprise-wide use of IT will align with and enhance achievement of the enterprise's business strategy. One effective way to represent the enterprise is through a conceptual representation or framework, which allows people to agree on definitions, build common understanding and identify issues for resolution. The ITA begins with a conceptual framework that provides a simple and familiar structure that can be used to understand how the components of IT are related to and interact with each other in support of the Business Objectives. To assist in the development of the ITA, Student Financial Assistance has utilized an industry "best practice": a Strategic Enterprise IT Planning Framework that portrays the components and views of the ITA.

There are different levels at which an architecture can be examined from high level and abstract to concrete and tangible. The IT Planning Framework identifies the various aspects of technology that must be addressed by an ITA. The approach and concepts behind this planning framework were adapted from a framework for enterprise architecture defined by John A. Zachman. As seen in Exhibit 1-2, the framework lists the architecture components for each view (Planner, Owner, Architect, Builder, Assessor and Change Agent).

Exhibit 1-2: Strategic Enterprise IT Planning Framework

	Views	Drivers			IT Architecture				
	Abstraction Level	**Management and Governance**	**Business Architecture**	**IT Direction**	**Information Architecture**	**Application Architecture**	**Infrastructure Architecture**	**Systems Management**	**Security**
PHASE 1 DEVELOPMENT	**Strategic** *Ballpark View*	▶ Investment Review Board (IRB)	▶ Business Vision ▶ Business Objectives	▶ IT Objectives	▶ Information Component Overview	▶ Application Component Overview	▶ Infrastructure Component Overview	▶ Systems Management Component Overview	▶ Security Component Overview

	Views	Drivers			IT Architecture				
	Abstraction Level	**Management and Governance**	**Business Architecture**	**IT Direction**	**Information Architecture**	**Application Architecture**	**Infrastructure Architecture**	**Systems Management**	**Security**
	Owner's View	▸ Architecture Management Board	▸ Operating Principles ▸ Business Context and Direction ▸ Business Context Model ▸ Business Function-Process Model ▸ Logical Business Locations ▸ Organizational Structure ▸ Function-Process Responsibilities ▸ Process Location and Usage Map	▸ Guiding Principles	▸ Information Portfolio ▸ Information to Function Matrix ▸ Information to Organization Matrix ▸ Information to Application Matrix ▸ Information Location and Usage Map ▸ Conceptual Data Model	▸ Application Portfolio ▸ Application to Core Capability Matrix ▸ Application to Organization Matrix ▸ Application Location and Usage Map ▸ Core Application Flowchart ▸ Application Guiding Principles	▸ Infrastructure Portfolio ▸ Infrastructure to Organization Matrix ▸ Infrastructure to Information Matrix ▸ Infrastructure to Application Matrix ▸ Technology Drivers	▸ Systems Management Functions ▸ Systems Management to Organization Matrix ▸ Systems Management to Information Matrix ▸ Systems Management to Application Matrix ▸ Systems Management to Infrastructure Matrix	▸ Security Functions ▸ Security to Organization Matrix ▸ Security to Information Matrix ▸ Security to Application Matrix ▸ Security to Infrastructure Matrix
	Logical *Architect's View*	▸ Architecture Working Group(s)	▸ Business Policies ▸ Detailed Process/Value	▸ IT Policy ▸ IT Selections	▸ Information Blueprint	▸ Application Blueprint ▸ Application Component	▸ Infrastructure Blueprint	▸ Systems Management Blueprint	▸ Security Blueprint

	Views	Drivers			IT Architecture				
	Abstraction Level	**Management and Governance**	**Business Architecture**	**IT Direction**	**Information Architecture**	**Application Architecture**	**Infrastructure Architecture**	**Systems Management**	**Security**
			Flows			Structure			
SUBSEQUENT PHASES OF DEVELOPMENT	**Physical** *Builder's View*		▶ Business Standards and Procedures ▶ Business Agreements ▶ Work Flows ▶ Roles/Responsibilities	▶ IT Selections	▶ Information Allocations ▶ Information Implementation Designs	▶ Application Selections ▶ Application Allocations ▶ Application Implementation Designs	▶ Infrastructure Selections ▶ Infrastructure Allocations ▶ Infrastructure Implementation Designs	▶ Systems Management Selections ▶ Systems Management Allocations ▶ Systems Management Implementation Designs	
	Situational *Assessor's View*		▶ Current Performance Metrics ▶ Industry/Market Trends ▶ Performance Gaps ▶ Business Drivers for Change	▶ IT Direction Assessment ▶ Gap Analysis	▶ Information Assessment	▶ Application Assessment	▶ Infrastructure Assessment	▶ Systems Management Assessment	

	Views	Drivers			IT Architecture				
	Abstraction Level	**Management and Governance**	**Business Architecture**	**IT Direction**	**Information Architecture**	**Application Architecture**	**Infrastructure Architecture**	**Systems Management**	**Security**
	tional *Change Agent's View*		▸ Target Performance Metrics	▸ Transition Approach ▸ Transition Initiatives ▸ Business Value of Initiatives ▸ Initiative Schedule					

2.3 ITA Document Outline

Each of the components of the target ITA is described in detail in one of the upcoming sections. The sections describe the interrelationships of SFA's business functions and its use of IT to support those functions. Having provided an introduction to the subject matter, this first section will be followed by Sections 2 through 8, which address the remaining components of the ITA:

Section 2: IT Direction

Section 3: Business Architecture

Section 4: Information Architecture

Section 5: Application Architecture

Section 6: Infrastructure Architecture

Section 7: Security Architecture

Section 8: Enterprise Architecture Management (EAM)

2.4 Project Phases

SFA is currently in the "framework" phase of the target ITA development. In this phase of the project, the ITA Staff will develop a Conceptual Architecture that covers at a high level the following components of the architecture: IT Direction, Business Architecture, Information Architecture, Application Architecture, Infrastructure Architecture and Security Architecture and establish the EAM framework. Future phases of this effort will build out the SFA ITA.

2.5 Evergreening

Technological changes, as well as ongoing technology assessments, will drive architectural updates and adjustments. End-users of the technology may also influence the architecture as technology is applied to their business processes and new functional requirements are realized. All of these factors contribute to the need for continuing updates of the architecture. Such updates will be planned and conducted under the management and governance process. We call this "Evergreening."